---------- *RESEARCH HIGHLIGHTS* ----------

Greater Sage-Grouse in the Southeast Montana Sage-Grouse Core Area

MONTANA FISH, WILDLIFE AND PARKS (FWP)
in partnership with:
USDI BUREAU OF LAND MANAGEMENT (BLM)

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We studied 94 greater sage-grouse hens in the Southeastern Montana Sage-Grouse Core Area (hereafter: Core Area; Fig. 1) to determine demographic rates, quantify seasonal movements and habitat use, and make management recommendations. Sage-grouse Core Areas support Montana's highest densities of sage-grouse, and are high priority conservation focus areas critical to the long term sustainability and management of sage-grouse. Historic lek data (pre-1980) from the Core Area are unavailable, but lek counts conducted over the past 30 years indicate the population has not exhibited a long-term downward trend. The population peaked during the mid-2000's but declined following a West Nile virus (WNv) outbreak in 2007 (Fig. 2). Sage-grouse have persisted at sustainable levels in the Core Area because traditional landowners have maintained large expanses of intact

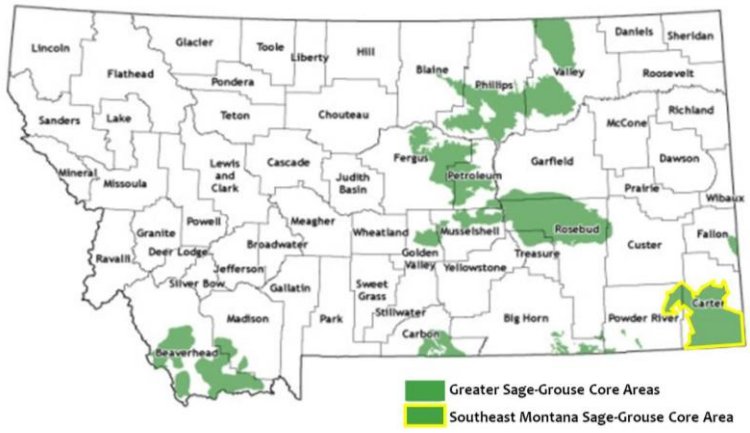

Fig. 1. The Southeast Montana Sage-Grouse Core Area.

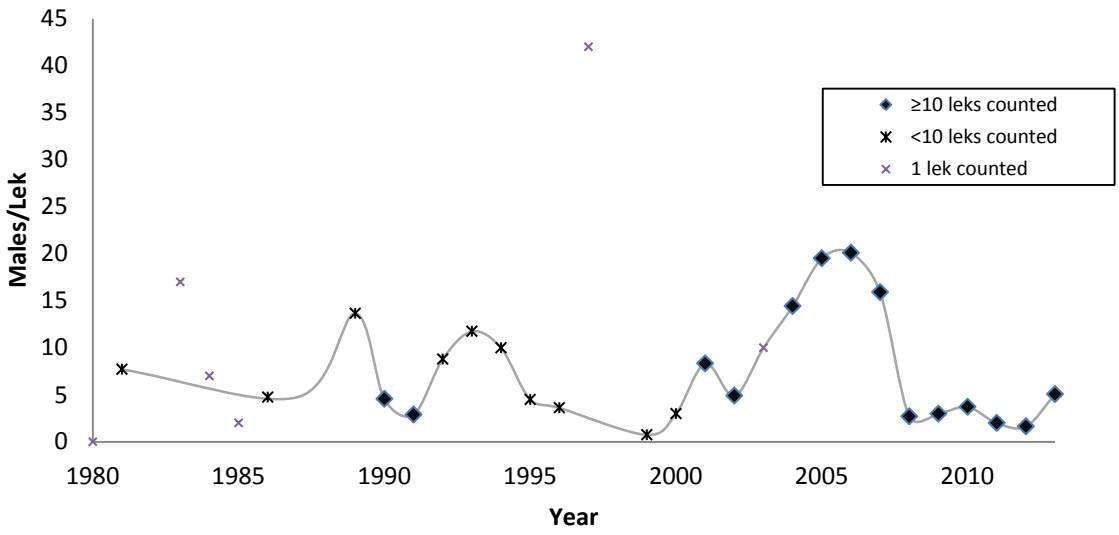

Fig. 2. Average number of greater sage-grouse males counted per lek in Carter County, Montana, 1980–2013. Lek survey effort differed among years, with 0–107 leks surveyed in a single year.

Fig. 3. The Core Area contains large expanses of intact sagebrush-steppe habitat.

sagebrush-steppe habitat (Fig. 3).

Sage-grouse in southeastern Montana were exposed to extreme weather conditions throughout the study. Precipitation during spring/summer 2010 was 53% above average (Fig. 4). Precipitation during spring/summer 2011 was 67% above average, with 8 inches rainfall during May alone, which caused widespread flooding (100-year flood events). Drought conditions occurred during summer 2012 (Fig. 4). Above-average snowfall and below-average temperatures occurred during winter 2009-10. The following winter, 2010–11, was among the most severe on record (30 year winter event; Fig. 5). In contrast, winter 2011–12 was among the mildest on record.

Nest initiation (91%) and renest initiation (42%) rates were high. Apparent nest success varied among years (43% in 2010, 33% in 2011, and 68% in 2012). Low nest success in 2011 was driven by extreme precipitation that caused 9% of nests to fail and depressed hatch rates. Models relating vegetation characteristics to nest survival generally performed poorly, which indicates cover did not limit nest success during the study. Chick survival averaged 29%. Forb cover was higher for successful (12.2% cover) than failed (7.9% cover) broods. Forb cover and richness were related to precipitation and higher during wet years.

Fig. 4. Extraordinary precipitation during 2010 and 2011 resulted in tremendous growth of vegetation (left). Drought occurred in 2012, but abundant residual vegetation remained from the previous wet years (right).

Fig. 5. Snowfall during winter 2010–11 was nearly 3 times average, resulting in a vast snowscape and deep snow drifts throughout the Core Area.

Apparent nest success was higher for nests in pastures with livestock concurrently present (59%) than pastures without livestock (38%), and we observed no direct negative impacts (e.g., trampling) of livestock on nesting sage-grouse. Similarly, brood success from 0–14 days post-hatch was higher for broods hatched in pastures with livestock (79%) than without (61%). The mechanism driving this is unknown; it may have resulted from behavioral avoidance of livestock by predators, or reflect predator control efforts in areas with livestock. Our results concur with research elsewhere that livestock grazing is compatible with sage-grouse conservation.

During wet years 2010 and 2011, 36% of hatches and the bulk of the early brood-rearing period occurred after June 15 (a common end date for timing restrictions on disturbing activities associated with development projects; Fig. 6). During drought year 2012, all nests hatched by June 10 but the early brood-rearing period extended to mid-July. We recommend timing restrictions be maintained until July 15: in most years nesting would be complete, nearly all chicks would be >2 weeks old, and most broods would have reached 30 days. Extending

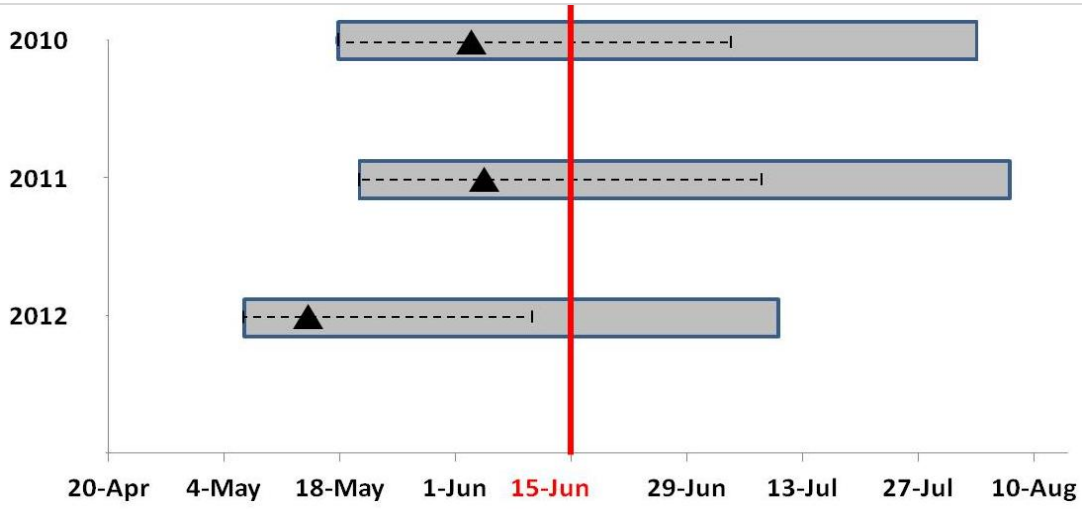

Fig. 6. Range of hatch dates (dashed lines), median hatch date (triangles), and early brood-rearing period (hatch + 30 days; shaded boxes) for radio-collared sage-grouse. During wet years 2010–11, 36% of hatches and the bulk of the early brood-rearing period occurred after June 15 (vertical red line), a common end date for timing restrictions. The nesting/brood-rearing season was shorter and earlier during drought year 2012.

timing restrictions to benefit young chicks may be important because most chick mortality occurs within the first 4 weeks post-hatch, and chick survival is one of the most important parameters influencing population growth for sage-grouse. However, timing restrictions are only effective for minimally invasive, short duration projects and cannot offset the impacts of long-term habitat loss, fragmentation, or degradation.

The average distance between nests and the nearest lek was 1.15 miles, which may reflect low levels of fragmentation and relatively intact sagebrush-steppe habitat in the Core Area. Fifty-nine percent of nests were within one mile of a known lek location, 84% within 2 miles, 93% within 3 miles, and 97% within 4 miles. Nest success exerts great influence on population growth rates for sage-grouse. Therefore, a one-mile buffer is inadequate to avoid significant population impacts associated with development activities. We recommend a minimum 4 mile buffer around leks for highly-intrusive practices within suitable sagebrush habitat. A 4 mile buffer may not be feasible in all cases. As with any project or planned development, consultation with an area wildlife biologist, early in the process, is critical to avoid or minimize impacts. Brood hens tended to stay close to nest sites for the first 30 days following hatch ($\bar{x}$ = 0.68 mi), thus restrictive radii placed around leks may also benefit young broods.

Annual hen survival in the Core Area during 2011–12 and 2012–13 (59–61%) was higher than survival during 2010–11 (45%), which was driven by lower late summer/fall survival (due to a suspected WNv outbreak) and lower winter survival due to severe conditions. Mortality was attributed to primarily avian (≥40%) followed by mammalian predation (≥27%). No mortalities were attributed to collision with fences or power lines, and no hunting mortalities

occurred. Population Viability Analyses (PVA) indicated that Core Area sage-grouse are very likely to persist at sustainable levels. Our most realistic scenario suggested a stable population (population growth rate = -0.8% annually) and 0% probability of extinction within 30 years. Severe weather events (floods and winter) had little impact on population growth (≤ 0.4% reduction in annual population growth) because of their rarity. The future impact of WNv is of concern because few tools exist to reduce WNv outbreaks, the severity of future outbreaks is impossible to reliably predict, and PVA indicated that the Core Area sage-grouse population is not undergoing rapid recovery since the 2007 outbreak. However, PVA did indicate the population has great potential to increase if environmental conditions or management actions improve population vital rates (e.g., 17.5% increase in annual population growth rate by increasing survival and reproduction rates by 5%).

We designated 19% of the Core Area as sage-grouse winter range (Fig. 7). Critical winter range consisted of windswept flats characterized by short shrubs ($\bar{x}$ = 7.8 in), and moderate shrub density ($\bar{x}$ = 11%; Fig. 8). Hens used areas with taller ($\bar{x}$ = 10.2 in) sagebrush during severe winter 2010–11, and 54% percent of hens shifted their winter ranges, presumably to locate open stands of sagebrush. Other hens were apparently unable to locate suitable habitat, based on reduced survival and observations of sage-grouse roosting on a barren snowscape during the severe winter (Fig. 9).

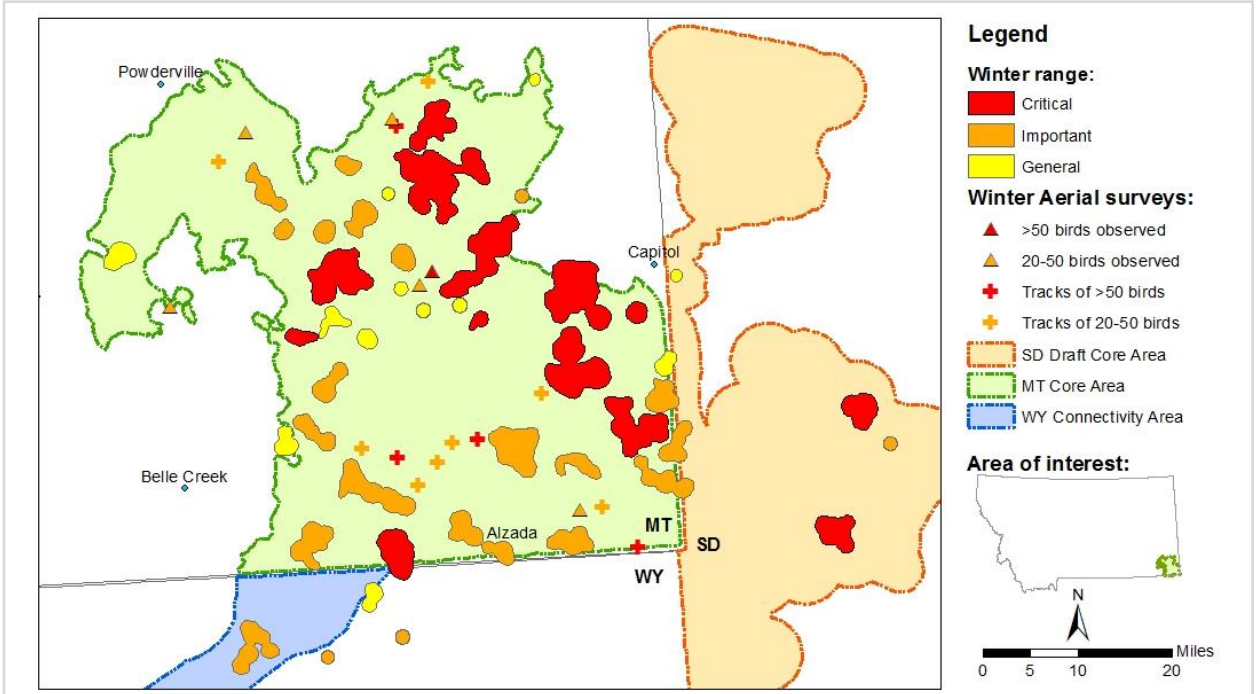

Fig. 7. Critical (red), important (orange), and general (yellow) sage-grouse winter range polygons in southeastern Montana and adjacent areas of Wyoming and South Dakota. Isolated aerial survey locations from the FWP sage-grouse winter database were mapped where birds or tracks indicated flocks of ≥20 sage-grouse.

Fig. 8. Example sage-grouse winter locations in the Southeast Montana Sage-Grouse Core Area.

Fig. 9. Heavy snow cover during winter 2010–2011 reduced hiding cover and concentrated sage-grouse, making the flock of 40+ birds highly visible in an aerial photo on the left. In contrast, normal winter conditions result in a mosaic of vegetative cover and snow patches, and the single hen in the lower left corner of the right photo is much less conspicuous.

Sage-grouse winter habitat use reflects that the Core Area is located at the eastern edge of the range of Wyoming big sagebrush, and is characterized by smaller, less dense sagebrush than elsewhere in the sage-grouse range. Sage-grouse in the study used sagebrush-steppe habitat extensively throughout their annual cycle (92% of locations), but frequently (27% of locations) used areas with sparse (1–10%) sagebrush canopy cover. Given that sagebrush characteristics may be intrinsically limited by local soil and climactic conditions, management guidelines that emphasize certain heights or densities of sagebrush may be unachievable in the Core Area. Management of sage-grouse habitat should focus on protecting the integrity of winter use and other important areas rather than sagebrush manipulation.

Movement patterns varied greatly among individual sage-grouse hens but the Core Area boundary in Montana contained nearly every location in the state, which provides evidence that the core area approach (i.e., delineating priority areas for sage-grouse conservation based on lek densities) has great potential to benefit sage-grouse. However, many hens made movements into South Dakota and Wyoming adjacent to the Core Area, and cooperation among states will be necessary to maintain this sage-grouse population. We recommend minor adjustments to the Montana Core Area and Wyoming Connectivity area to create a cohesive boundary and incorporate winter range. The South Dakota draft core area encompassed nearly all locations from radio-collared sage-grouse hens.

Traditional family-owned ranching operations, the predominant local stakeholders in the Core Area, have historically managed land in a manner that is compatible with sage-grouse conservation and are well-poised to collaborate with wildlife and range professionals to maintain and improve sage-grouse habitat. Our management recommendations are standard for sage-grouse and include the following: 1) first and foremost, maintain large expanses of intact sagebrush habitat, 2) utilize livestock grazing as a management tool (we recommend rotational grazing systems consisting of large pastures that incorporate rest during the growing season and alternate season of use), 3) implement conservation efforts on a landscape scale, including various stakeholders, 4) when projects must occur, plan to minimize the impacts, and 5) minimize the potential for WNv outbreaks where possible. We do not recommend predator control for several reasons: 1) population vital rates observed in the study were normal for sage-grouse and we expected the majority of mortalities and nest failures to be a result of predation (sage-grouse are a prey species—they do not typically die of old age, and nest predation is a fact of life that all ground nesting birds have evolved with), 2) controlling avian predators is not possible due to federal law (e.g., 1940 Bald and Golden Eagle Protection Act), 3) control of one type of predator often leads to unintended increases in other predator species, 4) predator control is expensive and only effective in the short term in small areas with intense control of all predators. In contrast, habitat management can result in economically feasible, widespread, long-term benefits for sage-grouse and livestock producers alike.